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In re Patent Application of:
HENDERSON ET AL.
Serial No. 09/939,517
Filing Date: AUGUST 24, 2001

In the Claims:

Claims 1 to 19 (Cancelled).

20. (Currently Amended) A method for detecting lighting flicker in an output of a video imaging device having a main picture area comprising an array of pixels for producing successive images at a frame rate, the method comprising:

producing a series of signals from at least one additional picture area adjacent the main picture area, the at least one additional picture area having a size ~~substantially~~ larger than a pixel, with each signal being a function of light incident on the at least one additional picture area in a time period ~~substantially~~ shorter than the frame rate;

accumulating a ~~predetermined~~ number of the series of signals to form a series of compound samples; and

filtering the series of compound samples to detect components indicating the lighting flicker.

21. (Previously Presented) A method according to Claim 20, wherein the time period is equivalent to a line rate of the main picture area.

22. (Previously Presented) A method according to Claim 20, wherein the at least one additional picture area comprises a plurality of additional picture areas.

23. (Previously Presented) A method according to Claim 20, wherein the filtering is performed by a bandpass filter tuned to a frequency of the lighting flicker.

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24. (Previously Presented) A method according to Claim 20, wherein each compound sample is formed at a sample rate which is a multiple of a nominal lighting flicker frequency; and wherein the filtering comprises taking a fundamental output component of a radix-N butterfly.

25. (Previously Presented) A method according to Claim 24, wherein N is equal to at least one of 3 and 4.

26. (Previously Presented) A method according to Claim 24, wherein the fundamental output component represents an instantaneous complex lighting flicker energy E, with E being averaged over time to produce a longer term estimate E′ of a lighting flicker energy.

27. (Previously Presented) A method according to Claim 26, wherein the longer term estimate E′ of the lighting flicker energy is produced according to

$$E' = E\mu + E' (1 - \mu)$$

where μ is a time constant.

28. (Previously Presented) A method according Claim 26, further comprising:

deriving a modulus of E′; and

comparing the derived modulus to a threshold T to give a final estimation of the lighting flicker being present if $|E'| > T$.

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29. (Previously Presented) A method according Claim 20, further comprising selecting an exposure setting for the main picture area for reducing the lighting flicker.

30. (Currently Amended) A method for reducing lighting flicker in an output of a video imaging device having a main picture area comprising an array of pixels for producing successive images at a frame rate, the method comprising:

detecting the lighting flicker in the output of the video imaging device, the detecting comprising

producing a series of signals from at least one additional picture area adjacent the main picture area, the at least one additional picture area having a size ~~substantially~~ larger than a pixel, with each signal being a function of light incident on the at least one additional picture area in a time period ~~substantially~~ shorter than that of the frame rate,

accumulating a ~~predetermined~~ number of the series of signals to form a series of compound samples, and

filtering the series of compound samples to detect components indicating the lighting flicker; and

selecting an exposure setting for the main picture area for reducing the lighting flicker.

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31. (Previously Presented) A method according to Claim 30, wherein selecting the exposure setting comprises selecting an exposure period which is an inverse of a frequency of the lighting flicker.

32. (Previously Presented) A method according to Claim 31, wherein the frequency of the lighting flicker includes a harmonic thereof.

33. (Previously Presented) A method according to Claim 30, wherein the time period is equivalent to a line rate of the main picture area.

34. (Previously Presented) A method according to Claim 30, wherein the at least one additional picture area comprises a plurality of additional picture areas.

35. (Previously Presented) A method according to Claim 30, wherein the filtering is performed by a bandpass filter tuned to a frequency of the lighting flicker.

36. (Previously Presented) A method according to Claim 30, wherein each compound sample is formed at a sample rate which is a multiple of a nominal lighting flicker frequency; and wherein the filtering comprises taking a fundamental output component of a radix-N butterfly.

37. (Previously Presented) A method according to Claim 36, wherein N is equal to at least one of 3 and 4.

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38. (Previously Presented) A method according to Claim 36, wherein the fundamental output component represents an instantaneous complex lighting flicker energy E, with E being averaged over time to produce a longer term estimate E′ of a lighting flicker energy.

39. (Previously Presented) A method according to Claim 38, wherein the longer term estimate E′ of the lighting flicker energy is produced according to

$$E' = E\mu + E' (1 - \mu)$$

where μ is a time constant.

40. (Previously Presented) A method according Claim 38, further comprising:

deriving a modulus of E′; and

comparing the derived modulus to a threshold T to give a final estimation of the lighting flicker being present if $|E'| > T$.

41. (Previously Presented) A method according Claim 30, further comprising selecting an exposure setting for the main picture area for reducing the lighting flicker.

42. (Currently Amended) A lighting flicker-detecting video camera comprising:

a main picture area comprising an array of pixels for producing successive images at a frame rate;

at least one additional picture area adjacent said main picture area and having a size ~~substantially~~ larger than a pixel, said at least one additional picture area being arranged for producing a series of signals each of which is a function of light incident on said at least one additional picture area in a time period ~~substantially~~ shorter than that of the frame rate;

accumulator means for accumulating a ~~predetermined~~ number of the series of signals to form a series of compound samples; and

filter means for filtering the series of compound samples for detecting components indicating the lighting flicker.

43. (Previously Presented) A video camera according to Claim 42, wherein said at least one additional picture area is defined by a strip of pixels down one side of said array.

44. (Previously Presented) A video camera according to Claim 43, wherein the strip of pixels is a column of pixels of said array, with each pixel in the column being connected together.

45. (Previously Presented) A video camera according to Claim 42, further comprising:

main gain control means for said main picture area; and

additional gain control means for said at least one additional picture area that is independent of said main gain control means.

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46. (Previously Presented) A video camera according to Claim 42, wherein said filter means comprises a radix-N butterfly.

47. (Previously Presented) A video camera according to Claim 46, further comprising an averaging circuit connected to an output of the radix-N butterfly.

48. (Previously Presented) A video camera according to Claim 47, wherein said averaging circuit comprises a first-order auto-regressive filter.

49. (Previously Presented) A video camera according to Claim 42, further comprising:

an automatic exposure control circuit;

a second exposure control circuit for setting an exposure period which is an inverse of a frequency of the lighting flicker or a harmonic thereof; and

control means for selectively connecting said automatic exposure control circuit and said second exposure control circuit to said main picture area for controlling exposure thereof based upon an output of said filter means.

50. (Currently Amended) A video camera comprising:

a main picture area comprising an array of pixels for producing successive images at a frame rate;

at least one additional picture area adjacent said main picture area and having a size ~~substantially~~ larger than a pixel, said at least one additional picture area being

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arranged for producing a series of signals each of which is a function of light incident on said at least one additional picture area in a time period ~~substantially~~ shorter than that of the frame rate;

an accumulator circuit for accumulating a ~~predetermined~~ number of the series of signals to form a series of compound samples; and

a filter for filtering the series of compound samples for detecting components indicating the lighting flicker.

51. (Previously Presented) A video camera according to Claim 50, wherein said at least one additional picture area is defined by a strip of pixels down one side of said array.

52. (Previously Presented) A video camera according to Claim 51, wherein the strip of pixels is a column of pixels of said array, with each pixel in the column being connected together.

53. (Previously Presented) A video camera according to Claim 50, further comprising:

a main gain control circuit for said main picture area; and

an additional gain control circuit for said at least one additional picture area that is independent of said main gain control circuit.

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54. (Previously Presented) A video camera according to Claim 50, wherein said filter comprises a radix-N butterfly.

55. (Previously Presented) A video camera according to Claim 54, further comprising an averaging circuit connected to an output of the radix-N butterfly.

56. (Previously Presented) A video camera according to Claim 55, wherein said averaging circuit comprises a first-order auto-regressive filter.

57. (Previously Presented) A video camera according to Claim 50, further comprising:

an automatic exposure control circuit;

a second exposure control circuit for setting an exposure period which is an inverse of a frequency of the lighting flicker or a harmonic thereof; and

a control circuit for selectively connecting said automatic exposure control circuit and said second exposure control circuit to said main picture area for controlling exposure thereof based upon an output of said filter.